SUCCESSFUL IMPLEMENTATION OF SMALLER COMMUNITY RESILIENCE – THE CITY OF SANTA MONICA, CALIFORNIA

R. Takiguchi

ABSTRACT

Implementing resilience programs in small jurisdictions is perceived as more challenging than similar programs in larger jurisdictions. This perception is mostly attributed to limited resources in smaller jurisdictions and the resources within the community. The building strengthening component of resilience, or seismic retrofit receives much of the challenged perception with immediate questions on cost and asset management. Presented in this abstract is the contention that smaller jurisdictions have a higher risk factor, from the standpoint of community continuity, but equal risk to lives and injury due to vulnerable buildings. The experiences of a small jurisdiction, the City of Santa Monica California illustrates the successful implementation of a seismic retrofit program.

1Assistant Community Development Director/Building Official, Burbank, California, City of Burbank, 150 N. Third Street, Burbank, California 91502 (rtakiguchi@burbankca.gov)

Takiguchi, R. Successful Implementation of Smaller Community Resilience – The City of Santa Monica, California, Earthquake Engineering Research Institute, Los Angeles, CA. 2018.
Introduction

Implementation of resilience programs in smaller jurisdictions can have different challenges from those of larger, more resourceful cities and counties. The component of resilience related to the strengthening of seismically vulnerable buildings can especially be challenging to small jurisdictions if the approach and process is taken out of context. Although the threat and consequences of seismic activity and building collapse is similar in both small and large jurisdictions, the approach in implementing a seismic retrofit program can be similar, if even on a scaled approach.

The City of Santa Monica California is one such small jurisdiction that was successful in implementing a mandatory seismic retrofit program in February 2017 that included all vulnerable building types including the world’s first known mandatory retrofit requirement for Steel Moment-Frame Buildings. This treatise shares the policy aspects and the authors experience during his tenure as the Chief Building Official for the City of Santa Monica while implementing the building-strengthening component of resilience.

The Importance of Increasing Resilience and Building Strengthening

California lives with the reality that it is a seismically hazardous region and the reality that there are vulnerable buildings that people necessarily occupy. Occupancy of vulnerable buildings is not a necessity however, as vulnerabilities can be addressed through seismic retrofit. The concept of resilient buildings through seismic retrofit contributes to centralized community continuity in all buildings with a special emphasis on residential housing.

Aside from the potential loss of lives, injury and displacement, it is contended that residents of smaller jurisdictions suffer greater consequences from collapsed residential buildings compared to residents in their larger counterparts. Smaller communities with multi-family dwellings with “soft, weak, open-front walls” may provide a significant amount of housing for the community. Multi-family dwelling structures play a vital role in smaller communities as residents often work locally and support the local economy. Loss of housing due to building collapse could cause permanent displacement of residents with related consequences.

Collapsed buildings also introduce the perception that one’s “home” – i.e. community, and familiar surroundings are no longer safe. The potential of relocation of residents and businesses can have a significant effect on smaller jurisdictions. The importance of strengthening vulnerable buildings serves as the realities of increase resilience.

Creating Awareness / Need

The City of Santa Monica is an 8.3 square mile Charter City in California. Of its approximate 93,000 residents, nearly 70% of its residents live in multi-family dwellings. Incorporated in 1875, Santa Monica, in an evolutionary scale of city growth went through a phase of multi-family housing construction in the 1940’s through the 1960’s. Many of the apartments constructed during this time were of the soft-story type and now known to contain inherent
While Californians, and residents of Santa Monica are generally aware of the potential of earthquakes and their damaging effects, they are generally not aware of the details of seismic retrofit. It is contended that many building owners are also not aware of the involvement of seismic retrofit work – technical application, jurisdictional requirements, retrofit cost, time involved, effect on occupants, interruptions to businesses and residences, and how and where to begin.

Awareness of earthquake hazards, seismic retrofit and building a safer and resilient City was presented to the community of Santa Monica by City staff. Building owners were asked the fundamental question of assessing hazards and building loss beyond insurance company risks with the major question being: “What is the impact of losing your asset as well as the loss to the community?” Building owners saw the importance of preserving their property asset, reducing liability and importantly protecting building occupants as well as the neighborhood and community.

**Steps in Implementing a Seismic Strengthening Program**

Although implementing a seismic retrofit program includes technical insight and technical application, the decisions in the implementation are not technical decisions. A seismic retrofit program is policy-driven decisions made by the policy-makers of a jurisdiction – the City Council or County Board of Supervisors.

The City of Santa Monica’s seismic retrofit program was developed in three major steps: (1) Assessment of Citywide Seismic Hazard; (2) Community Outreach and Ordinance Development; (3) Program Implementation. Each of the steps were necessary in providing recommendations for a retrofit program that was technically applicable, acceptable to the community and sustainable in completion.

(1) Assessment of Citywide Seismic Hazard. The first step in assessing program elements was how large is the problem of seismic hazard or, how many vulnerable buildings did the City have?

With a historical reference, the City of Santa Monica sustained significant damage from the 1994 Northridge Earthquake. Although Santa Monica was extremely fortunate not to have deaths resulting from the earthquake, many citizens were injured and several buildings were damaged with many being irreparable. Due to the geological structure of substrate material and direction of seismic wave effect, buildings that performed poorly were those with inherent vulnerabilities. Of particular failed potential were the more than 2,000 soft-story apartment buildings.

Present today in Santa Monica are still many soft-story multi-family dwellings. Although the majority of these existing buildings remain as rented apartment buildings, since the 1994 Northridge Earthquake, many of the buildings have been converted to condominium-owned units introducing elements of common interest and home owner association decisions. Assessment of the City’s vulnerable buildings included identification of both apartment and condominium soft-
story structures.

Most soft-story buildings are easily identified by period architecture style. City staff was able to catalog the soft-story structures and any prior retrofit inclusions. For the more complex Non-Ductile Concrete Buildings, and Steel Moment Frame Buildings, the City was assisted by a consultant specialized in structural engineering and vulnerable building assessment. The consultant provided an inventory of vulnerable buildings and provided recommendations on technical approaches. Mapping of each identified building is shown in Figure 1.

![City of Santa Monica map showing identified structures](image)

**Figure 1.** Identified structures during the assessment phase of Santa Monica’s Seismic Retrofit Program.

The results of the building identification allowed the City to understand the full extent of potential hazard allowing considerations for increased building resilience, effect on neighborhoods and needed concentrations for emergency response. Embracing the full magnitude of the issue allowed the next steps of community outreach and ordinance development.

(2) Community Outreach and Ordinance Development. The second phase was to create awareness among the community including building owners, building tenants, the Chamber of Commerce, and neighborhood groups. As an engaged community, Santa Monica was in support of an ordinance requiring building strengthening but wanted policies with practicalities leading to real results. The most common input received by the community was the required time in which to complete a seismic retrofit, and if retrofit costs can be passed-through or shared by building tenants.
The retrofit ordinances developed by Santa Monica was with the recognition that the City had the strong desire to be self-reliant, sustainable in emergencies, and develop increased resilience. Therefore, each of the vulnerable building types were presented to the Santa Monica City Council as mandatory retrofit. Some of the technical requirements included in the ordinance were the reference standards that would be applicable in a retrofit solution. A combination of the California Existing Building Code, International Existing Building Code, ASCE 41-13, and engineering best practices were applied. The balance between technical and administrative application enabled the determination of the timeline in which to complete the retrofit.

On February 14, 2017, the Santa Monica City Council unanimously approved a mandatory seismic retrofit ordinance for all vulnerable building types, citywide.

(3) Program Implementation. The third and longest aspect of the seismic retrofit program was the City’s implementation leading to the eventual completion of retrofit of vulnerable buildings. Implementation included notices being sent to building owners, reviewing engineering analysis and retrofit plans of buildings, permitting and inspection of retrofit work, and ensuring minimal interruptions to building occupants.

Considering that the City has nearly 1,700 unretrofitted multi-family soft-story buildings, it is likely to expect that full compliance of all 1,700 buildings will extend beyond the six year time frame. Included in the seismic retrofit program is a 20-year time frame in which Steel Moment Frame Buildings must complete retrofit. Although the time frames may appear to be extensive when measured against safety, real and practical approaches were necessary in providing a program that is sustainable and achievable.

Completing retrofit of vulnerable buildings is a finite task by completing one building at a time. The effort leading to an effective seismic retrofit program is of course dependent on good policy, sustained effort, and resource availability.

**What is a Seismic Retrofit Program?**

ASCE 41 and other technical documents identifies various types of vulnerable buildings as a measure of inherent building features such as non-ductile concrete and non-ductile steel. ASCE 41 also addresses deficient design features such as discontinuities and irregularities that may be found in any of the vulnerable building types.

A jurisdiction, whether small or large must decide if a seismic retrofit program will address only the inherent characteristics of vulnerable buildings, or include addressing elements of “bad” design, that are now known by today’s standards.

A goal that must be understood is that retrofit and strengthening of structures allows buildings to perform better in seismic activity and makes buildings safer overall. It must also be understood and presented as public disclosure that a retrofit effort will not allow buildings to be “earthquake proof” and may only allow older vulnerable buildings to achieve life-safety minimum. The standards of ASCE 41 of Basic Performance Objectives should be considered in determining a “level” of building retrofit and the building component of resilience.
Conclusions

As a resilience component, strengthening of buildings to allow safer buildings is possible. The overwhelming issue of retrofit is cost – either as an initial investment or as a recoverable asset with tenant pass-through costs. It is the experience of this author that careful planning of an owner’s asset, i.e. their building, is key to seismic retrofitting of their asset, as it is with careful planning and development of a seismic retrofit program.

A building owner’s investment is also an investment into the community and the continuance of the basic provision of housing and business outlets. It is also contended that California has the resources that every building owner needs to initiate seismic retrofit with the many capable structural engineers and retrofit specialists in California. A further contention is that effort breeds opportunity including resources of financing options, new techniques in retrofit solutions, and acceptance by building officials to consider alternate engineering solutions.

Acknowledgments

In the effort of seismic retrofit and increased resilience, many highly capable professionals are involved, primarily the scientific and structural engineering community that contributes to the effort.

Much of the resilience efforts in California can be attributed to one the leading experts in seismology and earthquake science, Dr. Lucile M. Jones, Ph.D., of The Dr. Lucy Jones Center For Science And Society and former science advisor for risk reduction for the United States Geological Survey. Dr. Jones has been instrumental and invaluable in advising cities, counties, government agencies and building officials in encouraging resilience efforts - including the City of Santa Monica.

The Structural Engineers Association of California and its branch in Southern California is commended for its efforts in local jurisdiction effort. Mr. Daniel Zepeda, S.E., Principal for Degenkolb Engineers and Chairperson for the Existing Buildings Committee of the Structural Engineers Association of Southern California provided the highest of structural and technical advisement in the formation of seismic retrofit programs for many California jurisdictions.

References


2. City of Santa Monica California. Seismic Retrofit Program. City of Santa Monica: https://www.smgov.net/Departments/PCD/Programs/Seismic-Retrofit/